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TRANSMITTAL FORM

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Application Number	10/788,482
Filing Date	MARCH 1, 2004
First Named Inventor	MARK H. A. TIGGES
Art Unit	2628
Examiner Name	JAVID A. AMINI
Attorney Docket Number	198821-368890
Total Number of Pages in This Submission	33

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
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- ☐ Information Disclosure Statement
- ☑ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	MCCARTHY TETRAULT LLP (CUST. NO. 27,155)		
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Date	DECEMBER 7, 2006	Reg. No.	54,883

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December 7, 2006

VIA COURIER

United States Patent and Trademark Office
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Randolph Building
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Alexandria, Virginia 22314
U.S.A.

Dear Commissioner for Patents:

RE:	**U.S. Patent Application No. 10/788,482**
Applicant:	**Mark H. A. Tigges**
For:	**Method and System for Inversion of Detail-In-Context Presentations**
Docket No.:	**198821-368890**

Please find attached the following documents for filing with respect to the above patent application:

1.) Transmittal Form (1 sheet);
2.) Certified Copy of Priority Document: Canadian Patent Application No. 2,328,794; Filed December 19, 2000 (5 pages); and,
3.) Certified Copy of Priority Document: Canadian Patent Application No. 2,341,965; Filed March 23, 2001 (27 pages).

The Commissioner is hereby authorized to charge all necessary fees and to credit Deposit Account No. 150633 in the name of McCarthy Tétrault LLP (Customer No. 27,155).

Please date stamp and return to us the enclosed "Return Receipt Postcard".

Thank you very much for your assistance in this matter.

Yours very truly,
McCarthy Tétrault LLP

Per: J. Conneely

Joseph Conneely
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La présente atteste que les documents ci-joints, dont la liste figure ci-dessous, sont des copies authentiques des documents déposés au Bureau des brevets.

This is to certify that the documents attached hereto and identified below are true copies of the documents on file in the Patent Office.

Specification and Drawings, as originally filed, with Application for Patent Serial No: **CA 2328794**, on December 19, 2000, by **ADVANCED NUMERICAL METHODS LTD.**, assignee of Mark H.A. Tigges, for "Computational Technique for Inversion of a Detail-In-Context Data Representation".

CERTIFIED COPY OF PRIORITY DOCUMENT

Agent certificateur/Certifying Officer

December 1, 2006

Date

Canada

(CIPO 68)
31-03-04

OPIC CIPO

COMPUTATIONAL TECHNIQUE FOR INVERSION OF A DETAIL-IN-CONTEXT DATA REPRESENTATION

Introduction

Detail-in-context representations of data using techniques such as pliable surfaces[1] are useful in presenting large amounts of information on limited-size display surfaces. Detail-in-context views allow magnification of a particular region of interest (the "focal region") in a data presentation while preserving visibility of the surrounding information. The ability to perform the inverse mapping from one or more points in the distorted (detail-in-context) data space back to the original undistorted original data space is of value in extending the capabilities of detail-in-context viewing to applications such as image editing. The ability to do an inverse mapping has additional important applications in the accurate positioning or repositioning by the user of one or more lenses within a given presentation space that has already been distorted. The distorted data space ultimately viewed by the user can be the end result of a series of distortion steps wherein the individual steps are not known. This document describes a computational technique for finding the inverse of a detail-in-context distortion of a data presentation. Such a presentation can be generated, using, for example, a perspective projection technique such as that described in reference 1. The basic goal can be simply stated as follows. Find, in general, the point in the undistorted data space which, when distorted, yields a specified point in the distorted data space. Then, if desired, the inverse mapping of the entire distorted space to the original undistorted data space can be obtained as the inverse mapping of the locus of the points in the distorted data space.

Description of the Invention or Technique

The solution presented herein is an iterative method that makes use of the distortion process itself as a component of an approximation technique for computing the inverse of the distortion. Figure 1 shows a cross-section of a data presentation based on a technology known as the Elastic Presentation Space[1], that uses viewer-aligned perspective projections to produce detail-in-context views in a reference view plane. In

this case, the undistorted two-dimensional data is placed in the basal plane of a three-dimensional perspective viewing volume. Points are displaced upward onto a distorted surface as shown, based on a three-dimensional "distortion function" D_3. A reference viewpoint V is defined as shown. The point X is the desired point in the distorted data space which we wish to locate in the undistorted data space. The first approximation point P_o is defined by the intersection point in the basal plane of the line through V and X. Successive approximations P_i for $i \geq 0$ are computed as follows. First, for $i=0$, point P_o is displaced onto the distorted surface by application of D_3. The resultant point on the distortion function is P_o^D. The point P_o^D is projected on the line V-X as shown to locate P_o^P, the closest point to P_o^D on V-X. P_o^P is then projected onto the basal plane in the opposite direction to that of the displacement due to the distortion, to produce the next approximation P_i. D^3 is applied to P_i and the process is repeated until sufficient accuracy is reached, such that $|D_3(P_i) - X| < \delta$ where δ is an acceptable tolerance which is application dependent. For example, an acceptable δ could be less than half the width of a pixel for a typical display surface such as a monitor. In certain cases such as folding[1] (the lateral displacement of a focal region through shearing of the viewer-aligned vector defining the direction of distortion), it is possible for successive approximations for P_i to diverge, in which case a bisection of approximation points can be used to search for the desired intersection with V-X.

Claims

1) Within a detail-in-context data presentation, the use of the distortion process or distortion function that produced the data presentation within an iterative technique for computing the inverse of the distortion.

2) The specific iterative technique using the following series of steps, to compute the inverse mapping from one or more points in a distorted (detail-in-context) data presentation back to the original undistorted original data space. Referring to figure 1, the point X is the desired point in the distorted data space which we wish to locate in the undistorted data space.
   i) The first approximation point P_o is defined by the intersection point in the basal plane of the line through V and X.
   ii) Point P_o is displaced onto the distorted surface by application of D_3. The resultant point on the distortion function is P_o^D.
   iii) The point P_o^D is projected on the line V-X as shown to locate P_o^P, the closest point to P_o^D on V-X. P_o^P is then projected onto the basal plane in the opposite direction to that of the displacement due to the distortion, to produce the next approximation P_i.
   iv) Successive approximations P_i for i>1 are then computed as follows. D^3 is applied to Pi, and the process is repeated until sufficient accuracy is reached, such that $|D_3(P_i) - X| < \delta$ where δ is an acceptable tolerance which is application dependent.

3) The use of the techniques described in 1) and 2) to accurately position a new focal region in a detail-in-context data presentation.

References Cited

1. M. S. T. Carpendale, A Framework for Elastic Presentation Space, Ph.D. Thesis, Simon Fraser University, Burnaby, BC, Canada 1992

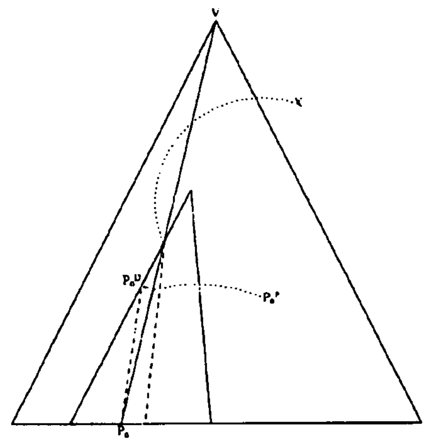

Figure 1: An example illustrating the first iteration and the point being sought in a simple EPS of a single lens with a linear drop-off function.